Membrane Structural Alterations in Murine Stratum Corneum: Relationship to the Localization of Polar Lipids and Phospholipases

To the Editor:

The principal theme of the article by Elias et al [1] is that the stratum corneum is not a metabolically inert tissue. However, this is not a new concept, and the report [1] merely adds an additional enzyme to the existing list of activities found in stratum corneum [2–4].

In support of their major point, the authors demonstrate that very small amounts of phospholipids can be detected in inner but not outer stratum corneum, as previously reported by others [5,6]. The present workers removed the outer stratum corneum material by tape stripping, which raises a question as to whether the tape adhesives interfered with the lipid analyses.

They also demonstrate, in Fig 1*a* of their paper, that the inner stratum corneum stains for phospholipids while the outer stratum corneum does not. This same figure was published nine years earlier (Fig 7 of Ref 7) and said to demonstrate that only the *viable* epidermis stained for phospholipids, while the stratum corneum did not stain [7]. What new information led to the present reinterpretation?

The authors demonstrate phospholipase activity in the intercellular spaces throughout the stratum corneum, and suggest that "First, increased generation of fatty acids from phospholipids, because of their amphipathic characteristics, may facilitate the dispersion of lamellar lipids into micelles within the outermost layers of the stratum corneum, hence, leading to desquamation." This proposal would seem to be irreconcilable with the data in Table II of their paper, which indicate that phospholipids could not be detected in the outer stratum corneum, and with the statement that the stacks of membrane bilayers in the outer stratum corneum can be revealed by osmium vapor fixation. Two references [8,9] were cited to support the latter point, but examination of those two references reveals that the lamellae were not localized to any particular region of the stratum corneum. In three other recent papers [10–12], the senior author of the present article [1] stated that the lamellae disappeared or could not be found beyond the mid-to-outer-third of the stratum corneum, which is contradictory to the present statement.

Finally, three recent publications in this journal [13–15] have demonstrated that postfixation with RuO_4 permits the visualization of lipid lamellae throughout the stratum corneum and even in desquamated material. It is curious that the authors of the article [1] should fail to cite these relevant publications.

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REPLY

In response to the comments of Wertz et al about our recent paper (1), first, we agree that the observation that the stratum corneum may be metabolically active is not new; we [2–4] and others (e.g., Refs 5–7) have demonstrated various types of hydrolytic enzyme activity both biochemically and cytochemically. The relative merits of adding an additional enzyme (phospholipase in the case) ought to be judged by the potential biological significance of the enzyme in the tissue concerned. In this report we not only show the localization of the enzyme to stratum corneum (SC) interstices, but also the likely consequences; i.e., a precipitous drop in phospholipid content with resultant changes in the structure of intercellular lamellae. Thus, the importance of our observations lies in the co-localization of this enzyme activity with lipid precursors, a finding that may have implications for both the formation of a hydrophobic barrier

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